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(54) Electrical connector for coaxial cables

(57) An electrical connector is provided for terminating a plurality of coaxial cables in a generally parallel planar array. A dielectric housing defines a cable insertion side and a termination side. A ground bar is provided on the housing at the cable insertion side thereof for engaging the conductive shields of the cables. A press bar is provided on the housing at the cable insertion side thereof for biasing the conductive shields of the cables into engagement with the ground bar. A plurality of insulation displacement terminals are mounted on the housing at the termination side thereof for engaging the inner conductors of the coaxial cables. A termination bar is provided on the housing at the termination side thereof operatively associated with the terminals to facilitate terminating the terminals with the conductors of the coaxial cables.

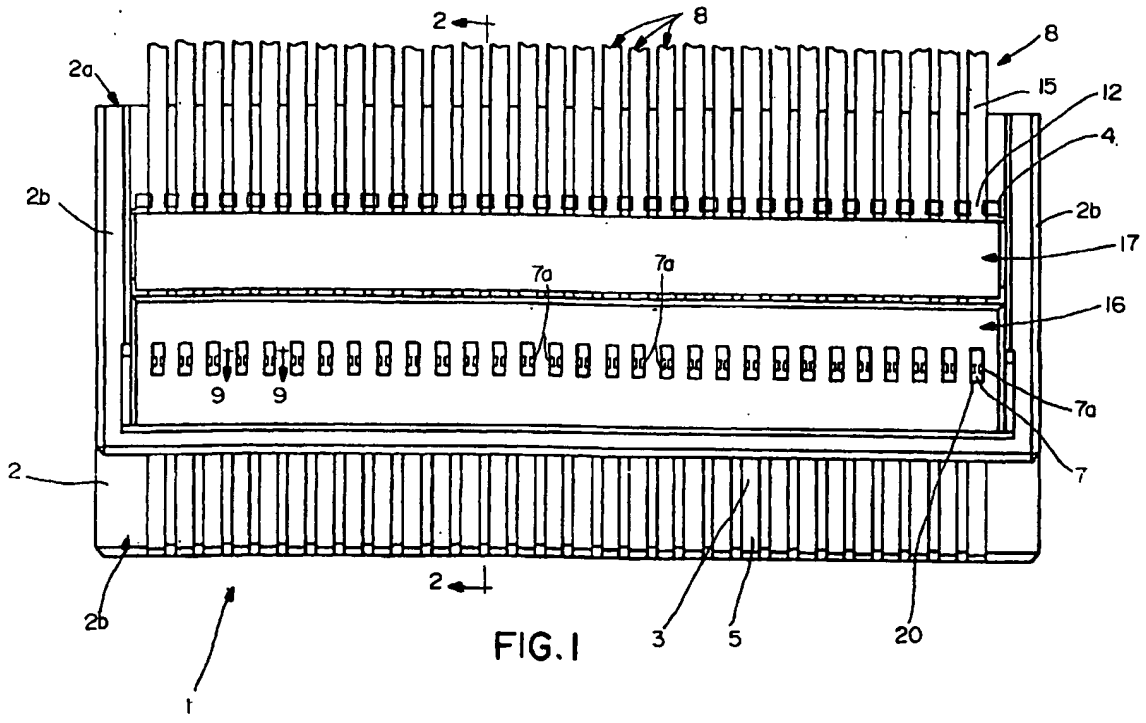

FIG. 1

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Description

Field of the Invention

[0001] This invention generally relates to the art of electrical connectors and, particularly, to a connector for terminating a plurality of coaxial cables.

Background of the Invention

[0002] Electrical connectors are known for terminating one or more coaxial cables so that the cables can be connected to other connecting devices, such as the terminals of a complementary mating connector, the circuit traces on a printed circuit board and the like. As is known, a typical coaxial cable includes a center conductive core or conductor surrounded by an insulating or dielectric sheath. A conductive shield surrounds the insulating sheath and typically is a metal braid. The shielding braid is surrounded by an outer dielectric tubular cover of the cable.

[0003] Various problems continue to be encountered when terminating a plurality of such coaxial cables in a single connector, and many of those problems center around the extremely small size of the cables, particularly the conductive core. The problems further are magnified by the miniaturization and high density of the connectors, themselves.

[0004] For instance, it is very difficult to maintain proper spacing between a plurality of high density, tiny conductive cores of a plurality of cables. It also is extremely time consuming and labor-intensive to strip the insulating sheaths away from the center conductive cores. Consequently, insulation-displacement terminals are used in some connectors, but, because of the tiny size of the conductive cores of the cables, it is difficult to maintain proper and constant pressure between the terminals and the cores and, consequently, failed connections occur. Such connectors also become further complicated when it is desirable to provide a common ground for the shielding braids of all of the cables.

[0005] The present invention is directed to solving these various problems in connectors for coaxial cables, by providing a very simple and reliable connector structural combination.

Summary of the Invention

[0006] An object, therefore, of the invention is to provide a new and improved electrical connector for a plurality of coaxial cables. For instance, the cables may be disposed in a generally parallel planar array.

[0007] In the exemplary embodiment of the invention, the connector includes a low profile dielectric housing defining a cable insertion side and a termination side. A ground bar is provided on the housing at the cable insertion side thereof for engaging the conductive shields of the coaxial cables. A press bar is provided on the housing at the cable insertion side thereof for biasing the conductive shields of the coaxial cables into engagement with the ground bar. A plurality of insulation displacement terminals are mounted on the housing at the termination side thereof for engaging the conductive cores of the coaxial cables. A termination bar is provided on the housing at the termination side thereof operatively associated with the terminals to facilitate terminating the terminals with the conductors of the coaxial cables.

[0008] As disclosed herein, the ground bar includes a plurality of slots for engaging the conductive shields of the cables. The ground bar is fabricated of sheet metal material and is folded back onto itself to increase the thickness and rigidity thereof. The press bar also is fabricated of conductive sheet metal material folded back onto itself to increase the thickness and rigidity thereof.

[0009] Each insulation displacement terminal includes a pair of insulation displacement arms defining a slot therebetween for receiving and engaging the conductor of a respective one of the coaxial cables. The termination bar includes separator means between the terminals to maintain a given spacing therebetween. The separator means also is configured to bias the arms of the terminals into engagement with the conductors of the cables.

[0010] Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description of the Drawings

[0011] The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIGURE 1 is a top plan view of an electrical connector incorporating the concepts of the invention and shown terminated to a plurality of coaxial cables in a generally parallel array;

FIGURE 2 is a section taken generally along line 2-2 of Figure 1;

FIGURE 3 is an end elevational view of the connector of Figure 1;

FIGURE 4 is a plan view of the connector, with the coaxial cables removed;

FIGURE 5 is a side elevational view of the insertion side of the connector;

FIGURE 6 is a side elevational view of the termination side of the connector;

FIGURE 7 is a perspective view of one of the insulation displacement terminals;

FIGURE 8 is a fragmented perspective view of a section of the ground bar;

FIGURE 9 is an enlarged, fragmented section taken generally along lien 9-9 of Figure 1, showing the separator/termination bar in conjunction with a pair of terminals;

FIGURE 10 is a bottom plan view of the separator/termination bar;

FIGURE 11 is a side elevational view of the separator/termination bar;

FIGURE 12 is an end elevational view of the separator/termination bar; and

FIGURE 13 is a section similar to that of Figure 2, but showing the connector mated with a complementary connector which, in turn, is mounted on a printed circuit board.

Detailed Description of the Preferred Embodiment

[0012] Referring to the drawings in greater detail, and first to Figures 1-6, the invention is embodied in a plug type electrical connector, generally designated 1, which includes a low profile dielectric housing 2 defining an insertion side, generally designated 2a, and a termination side, generally designated 2b. The housing may be molded of insulating material such as plastic. A plurality of insulation-displacement terminals 3 are mounted on the housing at termination side 2b. A ground bar 4 is mounted on the housing at cable insertion side 2a.

[0013] As seen best in Figure 7, each terminal 3 is stamped and formed from sheet metal material in a generally L-shaped configuration. Each terminal includes a flat contact blade 5 bent at 6 and extending at a right-angle to a pair of spaced contact arms 7a which define an insulation-displacement slot 7 therebetween. The connector is elongated as seen in Figure 1, and the terminals, including contact blades 5 and insulation displacement arms 7a, are spaced at a predetermined or given pitch lengthwise of the connector housing.

[0014] As seen best in Figure 1, a plurality of coaxial cables, generally designated 8, are terminated into insertion side 2a of connector housing 2 in a generally parallel planar array. As seen in Figure 2, each coaxial cable 8 includes an insulating or dielectric sheath 9 surrounding a center conductive core or conductor 10. Slot 7 (Fig. 7) between insulation displacement arms 7a of each terminal 3 is formed for receiving conductive core 10, and has a slightly smaller slot width than the diameter of the core. Therefore, when one of the coaxial cables is terminated in the terminal, the inside edges of insulation displacement arms 7a cut through insulating sheath 9 of the cable to establish conductive contact with the core of the cable.

[0015] As seen best in Figure 8, ground bar 4 includes an upright supporting plate 11 forming a plurality of slots 12. A base plate 13 of the ground bar is bent or folded back onto itself, as at 14, to provide an increased thickness and rigidity for the ground bar. The ground bar is stamped and formed of conductive sheet metal material.

[0016] As best seen in Figure 5, slots 12 in supporting plate 11 of ground bar 4 are spaced for alignment with insulation displacement slots 7 of terminals 3. When coaxial cables 18 are terminated in the connector, the shielding braids 15 (Fig. 2) of the cables are pressed into slots 12 of ground bar 4.

[0017] A separator/termination bar, generally designated 16, is mounted at termination side 2b of the connector for holding the conductive cores of the cables in termination with terminals 3. A press bar 17 is provided at insertion side 2a of the connector for holding shielding braids 15 of the cables in contact with ground bar 4. Both the separator/termination bar and the press bar are snapped into housing 2 at opposite ends of the bars by appropriate snapping flange and groove structures.

[0018] More particularly, referring to Figures 9-12 in conjunction with Figures 1 and 2, separator/termination bar 16 is molded of dielectric material such as plastic or the like. The bar has a plurality of grooves 19 seen best in Figure 11 for accommodating the sheathed cores 9/10 of the coaxial cables. An open area 20 (Fig. 10) also is aligned with each groove 19. As best seen in Figure 9, a plurality of triangularly shaped separating projections 21 are spaced longitudinally of separator/termination bar 16. A plurality of guiding projections 22 and 23 (Figs. 10 and 11) also are spaced longitudinally of the separator/termination bar.

[0019] As best seen in Figure 9, separating projections 21 have angled or tapered surfaces 21a which engage the outsides of insulation displacement arms 7a of terminals 3 to positively bias the arms inwardly against conductive cores 10 of the coaxial cables. This is shown by arrows 24 in Figure 9. This biasing force of the arms on the cores ensures and maintains a positive electrical connection between the cores and terminals. Therefore, projections 21 form a dual function of maintaining proper spacing between the contact sections of the terminals as well as biasing the arms of the terminals against the cable cores.

[0020] Guiding projections 22 and 23 also have tapered side surfaces 22a and 23a, respectively, as seen best in Figures 10 and 11. These tapered surfaces provide for smoothly guiding cores 10 covered by a sheaths 9 into grooves 19 upon mounting of separator/termination bar 16 onto housing 2.

[0021] As best seen in Figure 2, press bar 17 is fabricated of sheet metal material and is folded back onto itself to increase the thickness and rigidity thereof. The press bar is substantially the same size as base plate 13 of ground bar 4 to positively clamp coaxial cables 8, with shielding braids 15 engaged within slots 12 of the ground bar.

[0022] When it is desired to terminate coaxial cables 8 to connector 2, separator/termination bar 16 and press bar 17 are removed to provide a subassembly as shown in Figures 4-6. Then, a plurality of coaxial cables

8 are respectively terminated to terminals 2 and ground bar 4 as described above. In other words, the conductive cores of the cables are terminated within slots 7 between insulation displacement arms 7a of terminals 3 and shielding braids 15 of the cables are engaged within slots 12 of the ground bar. After the cables are so terminated, separator/termination bar 16 and press bar 17 are mounted to the top of housing 2. The separator/termination bar maintains proper separation between the terminals as well as biasing the insulating displacement arms of the terminals against the conductive cores of the cables, and press bar 17 biases the shielding braids of the cables against the ground bar.

[0023] Lastly, Figure 13 shows an example of connector 1 mated with a complementary connector 26 terminated to a printed circuit board 25. The mating connector is a receptacle-type connector and includes a plurality of terminals 28 mounted in a dielectric housing 27 having a ground shell 29 fitted about the housing. Terminals 28 have spring contact portions 30 for engaging contact blades 5 of terminals 3 of connector 1. Terminals 28 are connected to appropriate circuit traces on printed circuit board 25. When connector 1 is mated with connector 26, conductive press bar 17 of connector 1 engages outer ground shell 29 of connector 26. Consequently, ground bar 4 of connector 1, shielding braids 15 of coaxial cables 8, press bar 17 of connector 1 and ground shell 29 of connector 26 all are electrically connected to hold a stable ground potential and avoid electromagnetic interference at the interconnection of the connectors. The cores of the coaxial cables are electrically connected through terminals 3 of connector 1 and terminals 28 of connector 26 to the ground traces on printed circuit board 25.

[0024] It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.

Claims

1. An electrical connector for a plurality of coaxial cables in a generally parallel planar array, each cable including at least an inner insulated conductor and an outer conductive shield, comprising:

   a low profile dielectric housing defining a cable insertion side and a termination side;
   a ground bar on the housing at the cable insertion side thereof for engaging the outer conductive shields of the coaxial cables;
   a press bar on the housing at the cable insertion side thereof for biasing the conductive shields of the coaxial cables into engagement with the ground bar;
   a plurality of insulation displacement terminals on the housing at the termination side thereof for engaging the inner conductors of the coaxial cables; and
   a termination bar on the housing at the termination side thereof operatively associated with the terminals to facilitate terminating the terminals with the conductors of the coaxial cables.

2. The electrical connector of claim 1 wherein said ground bar includes a plurality of slots for engaging the outer conductive shields of the coaxial cables.

3. The electrical connector of claim 1 wherein said press bar is of conductive material.

4. The electrical connector of claim 3 wherein said press bar is fabricated of sheet metal material folded back onto itself to increase the thickness and rigidity thereof.

5. The electrical connector of claim 4 wherein said ground bar is fabricated of sheet metal material folded back onto itself to increase the thickness and rigidity thereof.

6. The electrical connector of claim 1 wherein said termination bar includes separator means to maintain a given spacing between the terminals.

7. The electrical connector of claim 6 wherein each insulation displacement terminal includes a pair of insulation displacement arms defining a slot therebetween for receiving and engaging the conductor of a respective one of the coaxial cables, said separator means being configured to bias the arms of the terminals into engagement with the conductors of the cables.

8. The electrical connector of claim 1 wherein said insulation displacement terminals each include a pair of insulation displacement arms defining a slot therebetween for receiving and engaging the conductor of a respective one of the coaxial cables, said termination bar including means for biasing the arms of the terminals into engagement with the conductors of the cables.

9. An electrical connector for a plurality of coaxial cables, each cable including at least an inner insulated conductor and an outer conductive shield, comprising:

   a dielectric housing defining a cable insertion side and a termination side;
   a ground bar on the housing at the cable insertion side thereof for engaging the outer conductive shields of the coaxial cables;

a plurality of terminals on the housing at the termination side thereof for engaging the inner conductors of the coaxial cables; and

a termination bar on the housing at the termination side thereof operatively associated with the terminals to facilitate terminating the terminals with the conductors of the coaxial cables.

10. The electrical connector of claim 9 wherein said ground bar includes a plurality of slots for engaging the outer conductive shields of the coaxial cables.

11. The electrical connector of claim 9 wherein said ground bar is fabricated of sheet metal material folded back onto itself to increase the thickness and rigidity thereof.

12. The electrical connector of claim 9 wherein said termination bar includes separator means to maintain a given spacing between the terminals.

13. The electrical connector of claim 12 wherein each terminal includes a pair of insulation displacement arms defining a slot therebetween for receiving and engaging the conductor of a respective one of the coaxial cables, said separator means being configured to bias the arms of the terminals into engagement with the conductors of the cables.

14. The electrical connector of claim 9 wherein said terminals each include a pair of insulation displacement arms defining a slot therebetween for receiving and engaging the conductor of a respective one of the coaxial cables, said termination bar including means for biasing the arms of the terminals into engagement with the conductors of the cables.

15. An electrical connector for a plurality of coaxial cables, each cable including at least an inner insulated conductor and an outer conductive shield, comprising:

a dielectric housing defining a cable insertion side and a termination side;

a ground bar on the housing at the cable insertion side thereof for engaging the outer conductive shields of the coaxial cables;

a press bar on the housing at the cable insertion side thereof for biasing the conductive shields of the coaxial cables into engagement with the ground bar; and

a plurality of terminals on the housing at the termination side thereof for engaging the inner conductors of the coaxial cables.

16. The electrical connector of claim 15 wherein said press bar is of conductive material.

17. The electrical connector of claim 16 wherein said press bar is fabricated of sheet metal material folded bask onto itself to increase the thickness and rigidity thereof.

18. The electrical connector of claim 17 wherein said ground bar is fabricated of sheet metal material folded back onto itself to increase the thickness and rigidity thereof.

19. The electrical connector of claim 15 wherein said ground bar has a plurality of cable-receiving slots aligned with termination sections of said plurality of terminals.

20. An electrical connector for a plurality of coaxial cables in a generally parallel planar array, each cable including at least an inner insulated conductor and an outer conductive shield, comprising:

a dielectric housing defining a cable insertion side and a termination side;

a ground bar on the housing at the cable insertion side thereof for engaging the outer conductive shields of the coaxial cables;

a plurality of insulation displacement terminals on the housing at the termination side thereof for engaging the inner conductors of the coaxial cables; and

said ground bar including a plurality of cableengaging slots aligned with termination sections of the insulation displacement terminals.

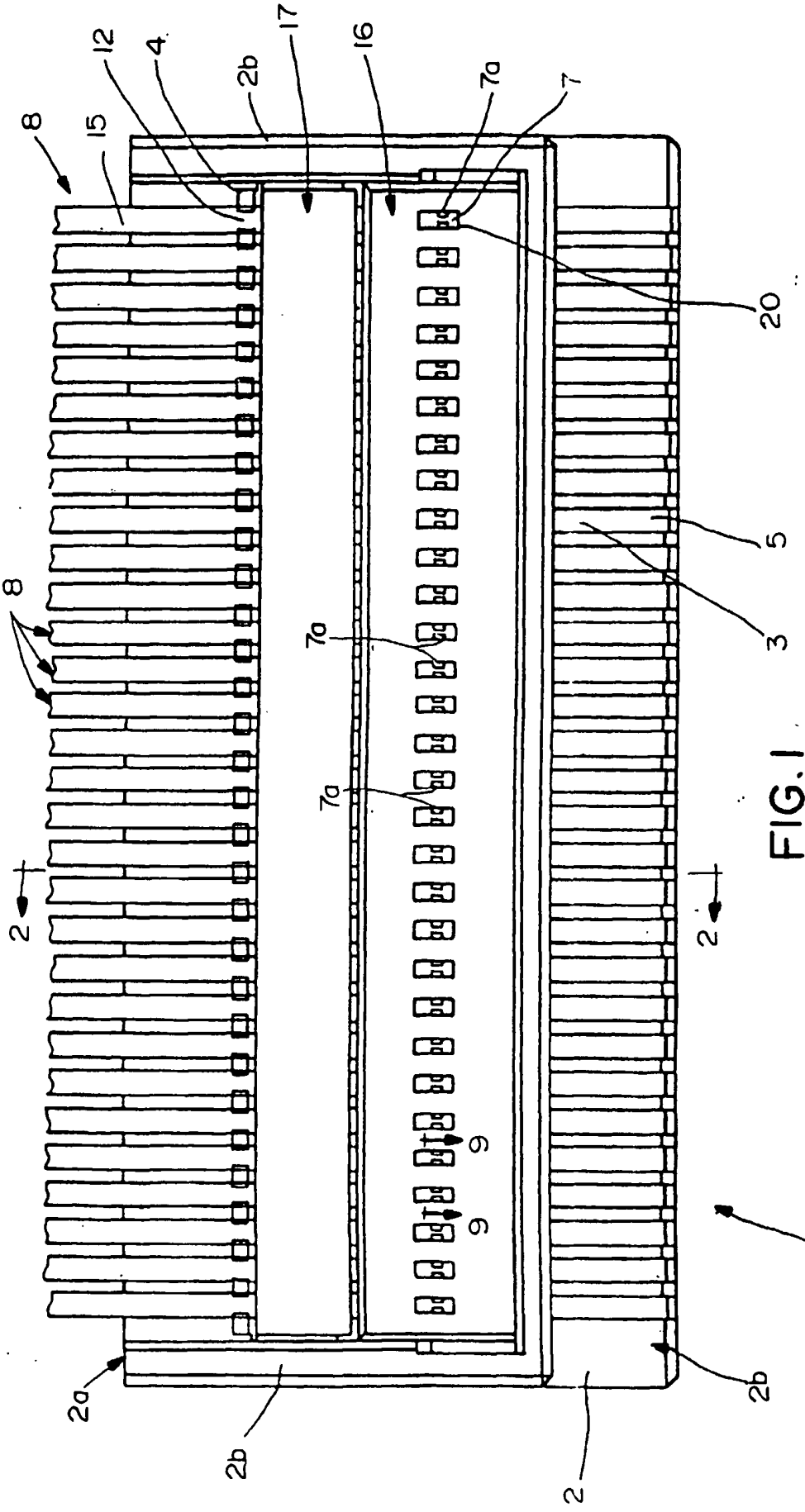

FIG. 1

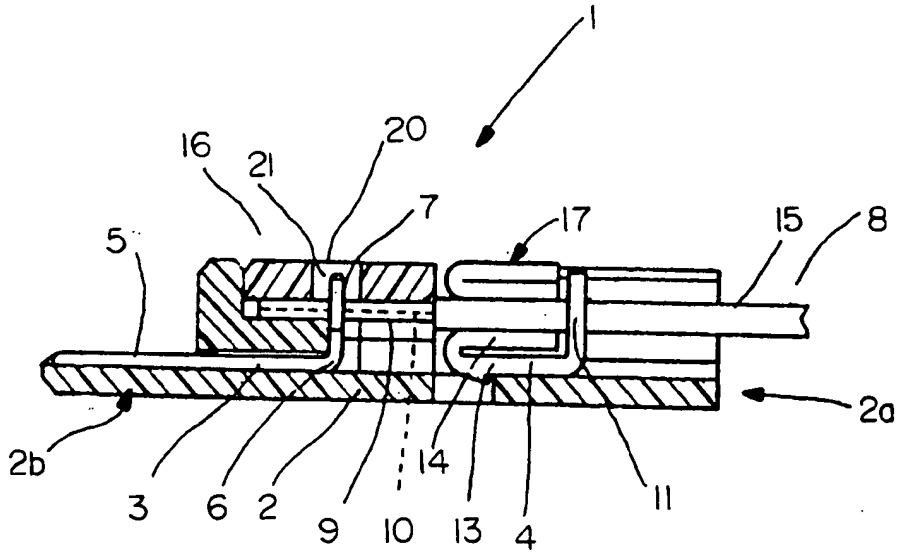

FIG. 2

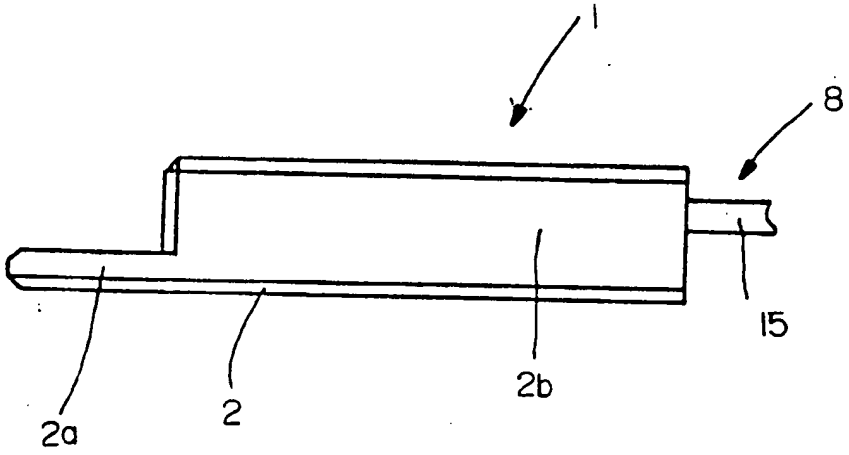

FIG. 3

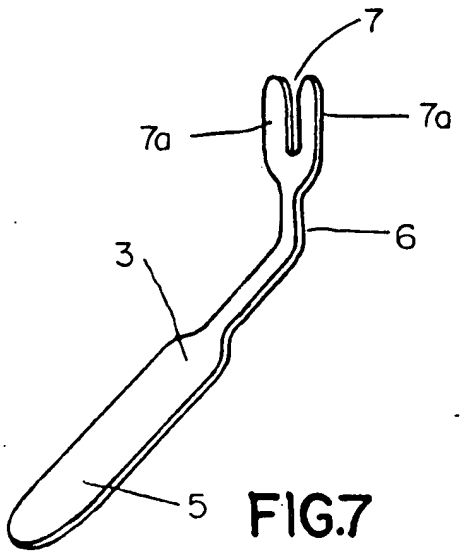

FIG.7

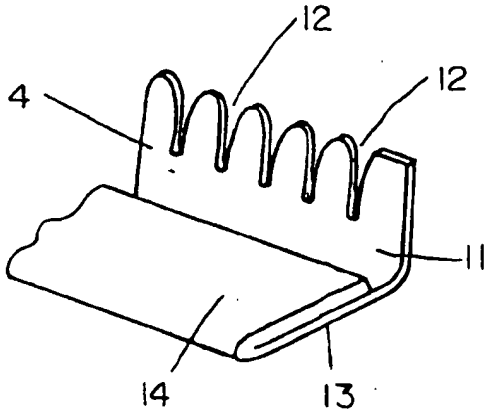

FIG. 8

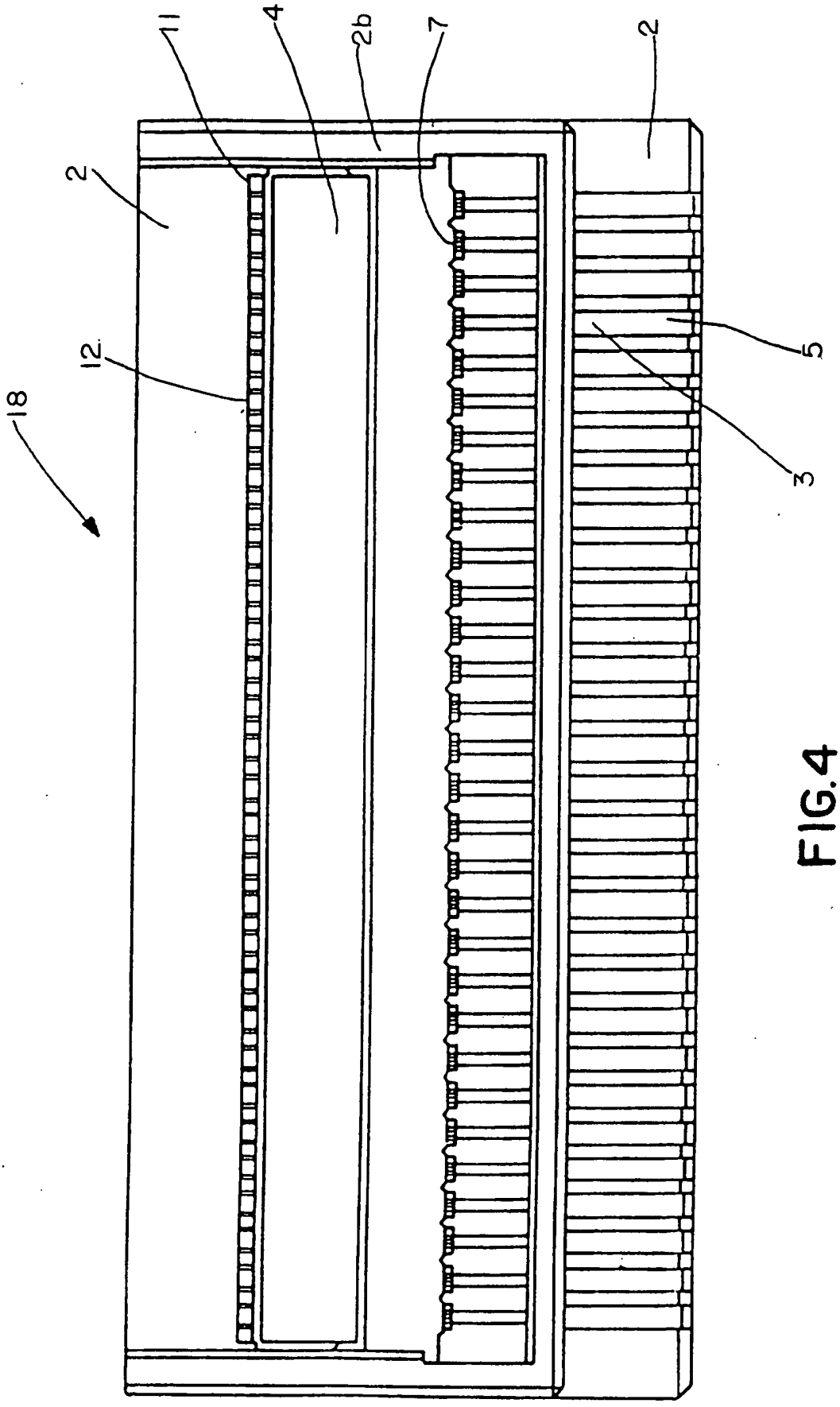

FIG.4

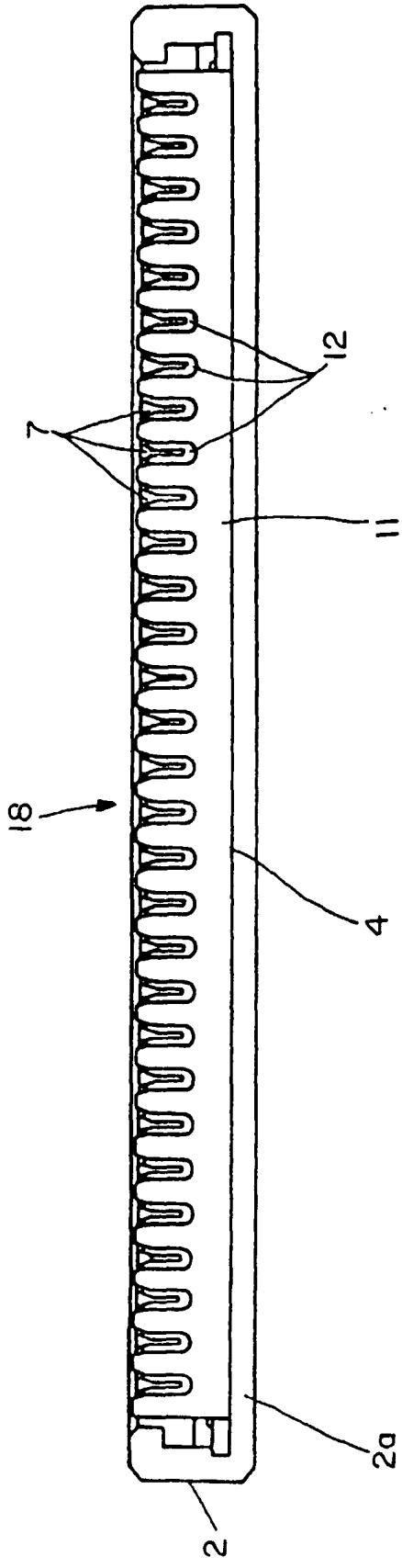

FIG.5

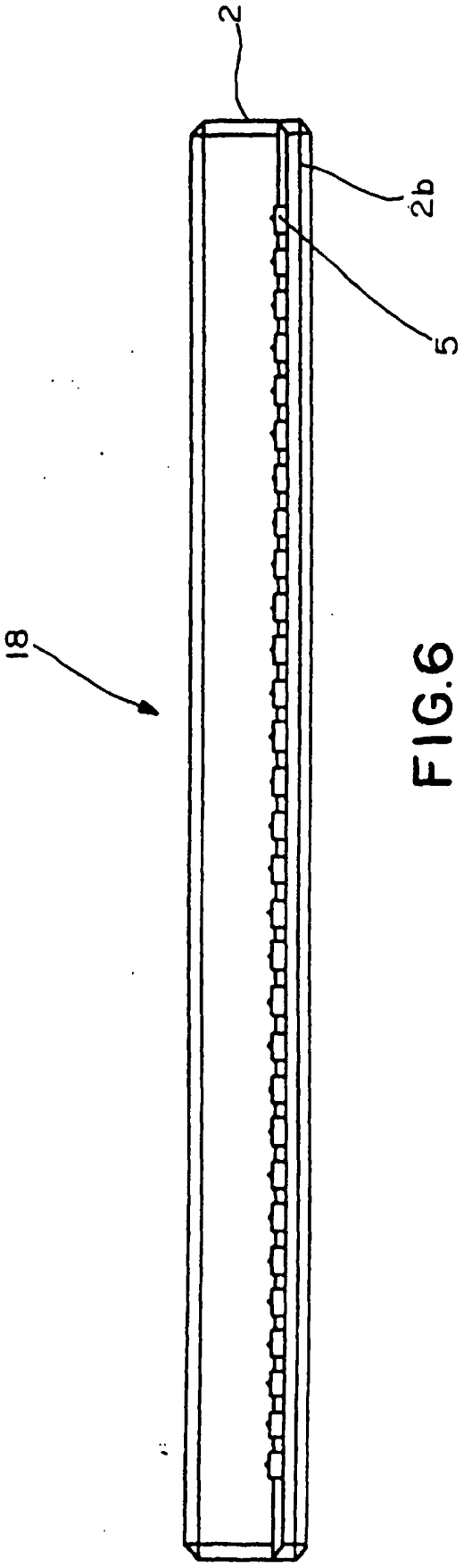

FIG.6

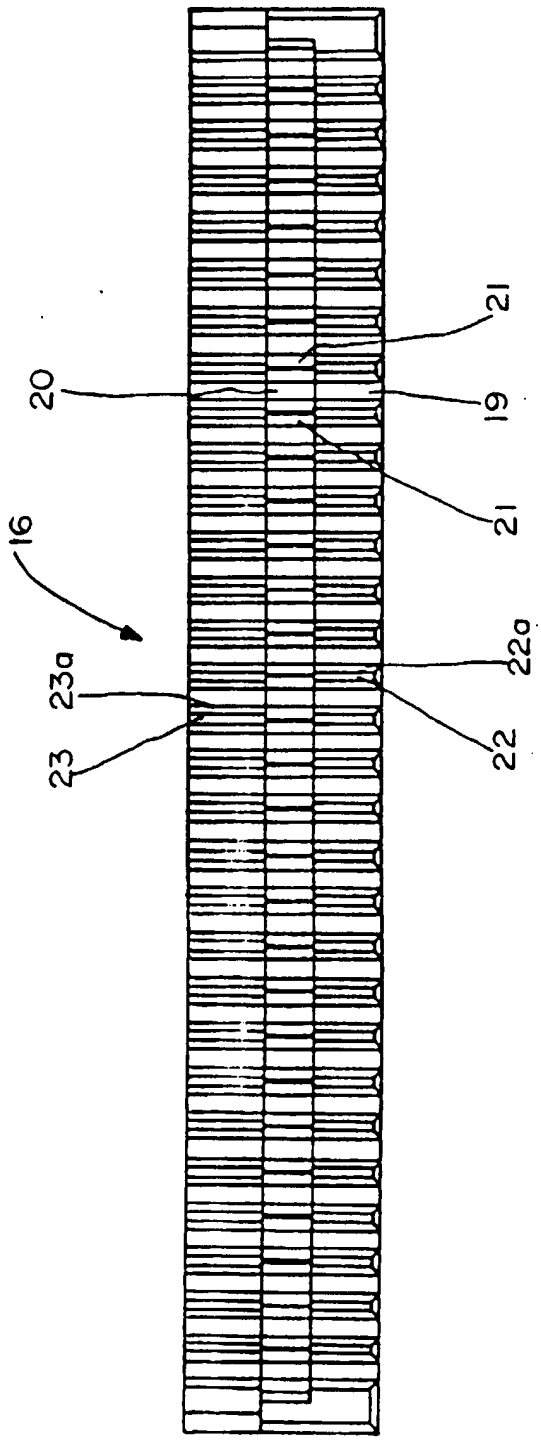

FIG.10

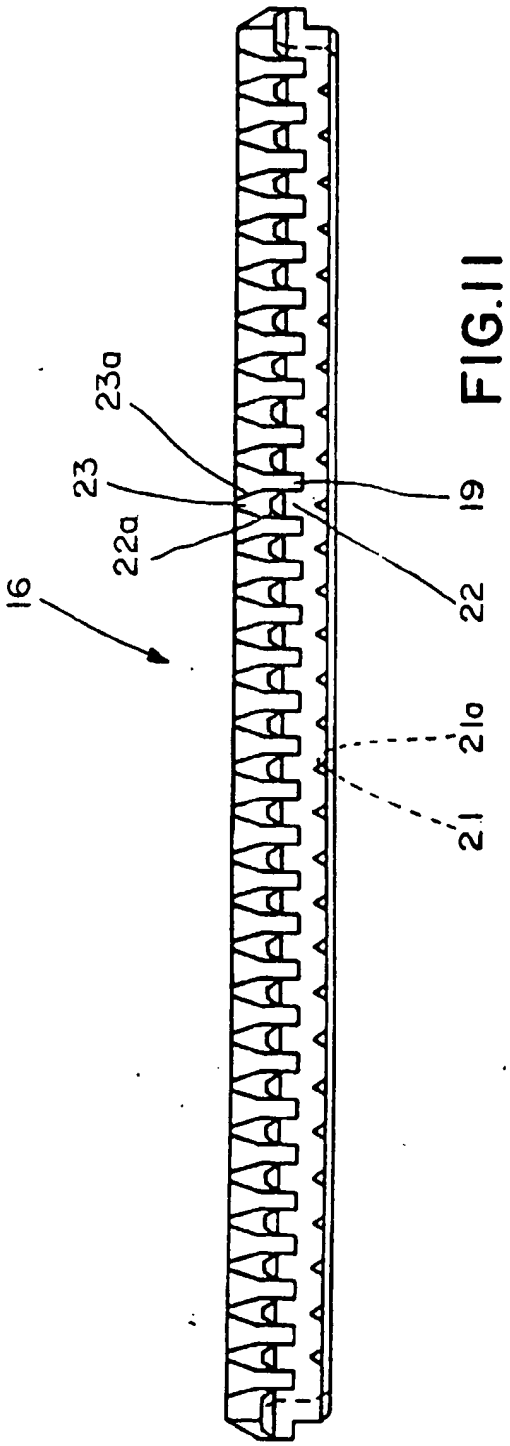

FIG.11

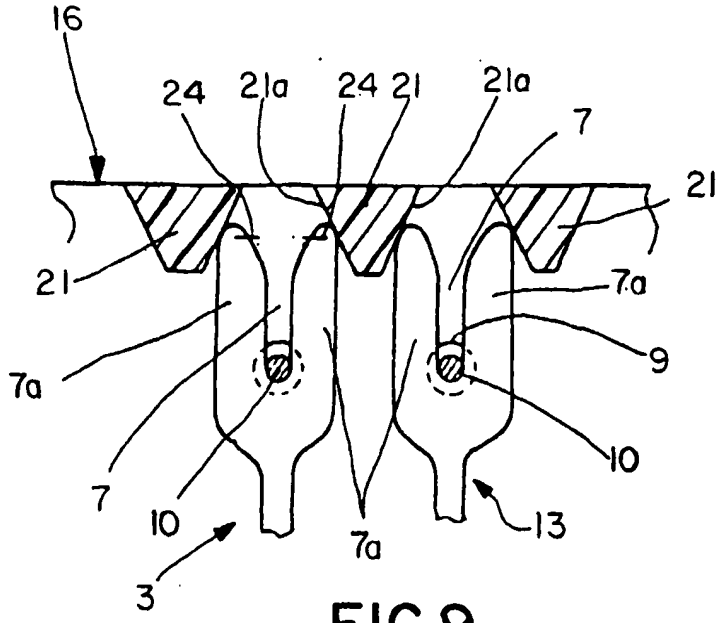

FIG.9

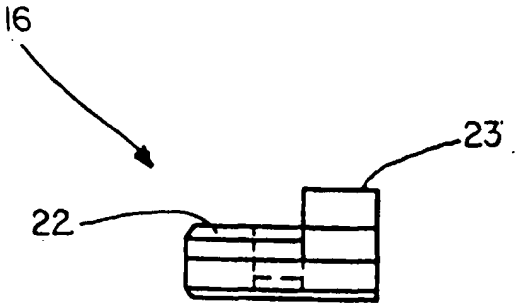

FIG.12

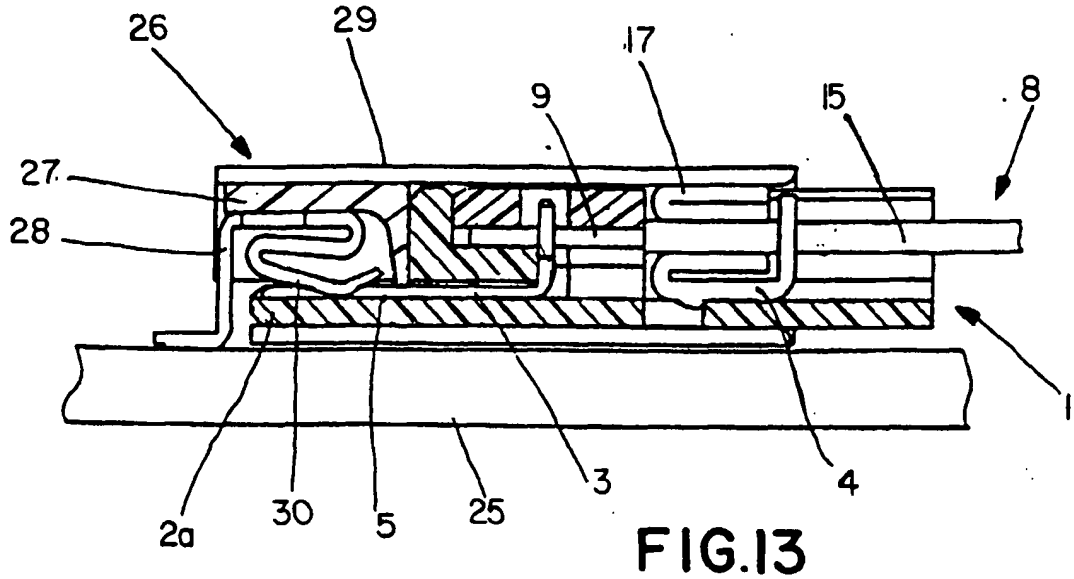

FIG.13